DECLARATION

I, Machiko Shoji, a staff member of TAIYO, NAKAJIMA & KATO, 3-17, Shinjuku 4-chome, Shinjuku-ku, Tokyo 160-0022, Japan, do hereby declare that I am well acquainted with the English and Japanese languages and I hereby certify that, to the best of my knowledge and belief, the following is a true and correct translation made by me into the English language of the documents in respect of Japanese Patent Application No. 2003-8985, that was filed on 17th January 2003 in the name of FUJI PHOTO FILM CO., LTD.

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[DOCUMENT NAME] SPECIFICATION

[TITLE OF THE INVENTION] IMAGE FORMING APPARATUS

[CLAIMS]

[Claim 1] A coating apparatus for coating with coating liquid a surface of a strip-shaped body carried in a fixed direction, the apparatus comprising:

a primary bar extending along a width direction of a carrying plane, which is a carrying path of the strip-shaped body;

a secondary bar extending in parallel with the primary bar and disposed at a downstream side of the primary bar; and

a between-bars liquid reservoir disposed between the primary bar and the secondary bar for storing the coating liquid at a time of coating of the coating liquid,

wherein coating conditions at the primary bar and the secondary bar are set so that the following condition is met,

$$W_2 < W_1$$

where W_1 is a coating amount of the coating liquid at the primary bar and W_2 is a coating amount of the coating liquid after the strip-shaped body has passed the secondary bar.

[Claim 2] A coating apparatus according to Claim1, wherein the coating conditions of the coating liquid at the primary bar and the secondary bar are set so that the following condition is met by W_1 and W_2,

$$W_2 < W_1 < 1.3 \times W_2.$$

[Claim 3] A coating apparatus according to Claim2, wherein the primary bar is a wire bar formed by winding a wire around a rod, and the coating amount of the coating liquid at the primary bar is set so that the following expression

$$W_1 = 17.4365 \times r(2.167\eta + 0.289K)/L$$

is met by W_1, a diameter r (mm) of the wire, a number of rotations K (rpm) of the primary bar, viscosity η (cps) of the coating liquid, and a carrying speed L (m/min).

[Claim 4] A coating apparatus according to any one of claims 1 to 3, further comprising an air-liquid interface forming means for forming an air-liquid interface, which is an interface between the coating liquid and air, at the between-bars liquid reservoir at a time of coating.

[Claim 5] A coating apparatus according to Claim4, wherein the air-liquid interface forming means includes a coating liquid sucking out means for sucking out the coating liquid stored in the between-bars liquid reservoir.

[Claim 6] A coating apparatus according to Claim5, wherein a primary coating liquid supply flow path for supplying the coating liquid is formed at an upstream side of the primary bar, and

the coating liquid sucking out means is a communicating flow path for allowing communication between the between-bars liquid reservoir and the primary coating liquid supply flow path.

[Claim 7] A coating apparatus according to any one of claims 1 to 6, wherein the strip-shaped body is a support web for forming a base material of a planographic printing plate precursor, and the coating liquid is a plate-making layer forming liquid for forming a plate-making layer of the planographic printing plate precursor.

[Claim 8] A coating method for coating with coating liquid a surface of a strip-shaped body carried in a fixed direction, the method comprising:

coating the surface of the strip-shaped body with the coating liquid at a primary bar, the primary bar extending along a width direction of a carrying plane, which is a carrying path of the strip-shaped body;

storing the coating liquid in a between-bars liquid reservoir that is disposed at a downstream side of the primary bar and located between the primary bar and a secondary bar, the secondary bar extending in parallel with the primary bar; and

regulating a coating amount of the coating liquid at the secondary bar,

wherein coating conditions at the primary bar and the secondary bar are set so that the following condition is met,

$W_2 < W_1$

where W_1 is a coating amount of the coating liquid at the primary bar and W_2 is a coating amount of the coating liquid after the strip-shaped body has passed the secondary bar.

[Detailed Description of the Invention]

[0001]

[Technical Field]

The present invention relates to a coating apparatus and a coating method, and specifically, to a coating apparatus and a coating method capable of performing coating stably in a broad range of coating conditions and inhibiting the occurrence of product failures, and a coating apparatus and a coating method capable of inhibiting the occurrence of product loss at the time of starting coating.

[0002]

[Prior Art]

A planographic printing plate precursor is manufactured generally by forming a support web by graining at least one surface of an aluminum web made of pure aluminum or aluminum alloy and forming anodic oxide coating on the surface if necessary, and then, by coating the grained surface of the support web with plate-making layer forming liquid such as photosensitive layer forming liquid and heat sensitive layer forming liquid and drying it to form a photosensitive or heat sensitive plate-making surface.

[0003]

A bar coater is generally used for coating a strip-shaped body such as the support web with the coating liquid such as the plate-making layer forming liquid.

[0004]

As the bar coater, conventionally, a bar coater has been generally used, which has a bar that rotates in the same direction as or opposite direction to a running direction of the web while being in contact with an under surface of the continuously running web, and a coating part that forms a coating liquid reservoir by discharging coating liquid on the upstream side of the bar in relation to the running direction of the web (hereinafter, referred to as just "upstream side"), and coats the under surface of the web with the coating liquid at the time of running of the web.

[0005]

As the bar coater, a bar coater (Patent Document 1) has been generally used, which has a first sheathing board provided close to the bar on the upstream side of the bar and formed so that the thickness of the upper end thereof is thinner toward the downstream side in relation to the running direction of the web (hereinafter, referred to as just "downstream side"), the upper end of the first sheathing board being bent toward the bar, and a flat surface having a length of 0.1 to 1 mm on the top thereof. A bar coater (Patent

Document 2) has been also used, which has a first sheathing board formed so that the thickness of the upper end thereof is thinner toward the downstream side, a bar, and a second sheathing board provided on the downstream side of the bar.

[0006]

However, when the running speed of the support web is increased, an entrained air film as a film of air running while accompanying the support web, i.e., entrained air tends to be formed on the surface of the support web.

[0007]

In both of the bar coaters, there is a problem that, when the entrained air film is formed on the surface of the support web, since the entrained air film is introduced into the coating liquid reservoir, the coating liquid becomes prevented from being deposited uniformly on the surface of the support web, and thereby, defects such as breakage of the film occur to cause unstable coating of the coating liquid.

[0008]

As a bar coater capable of solving the problem, a bar coater has been proposed, which has a primary bar disposed on the upstream side along the carrying direction of the support web, a secondary bar disposed on the downstream side of the primary bar, and a

between-bars liquid reservoir disposed between the primary bar and the secondary bar (Patent Document 3).

[0009]

[Patent Document 1] Japanese Utility Model Registration No. 63-126213

[Patent Document 2] Japanese Patent Application Publication (JP-B) No. 58-004589

[Patent Document 3] Japanese Patent Application No. 2002-147940

[0010]

By the bar coater disclosed in Patent Document 3, the problem that various kinds of defects due to the entrained air occur when the carrying speed is high may be solved.

[0011]

[Subjects to be Addressed by the Invention]

However, even in the bar coater disclosed in Patent Document 3, in the case where the relationship between a coating amount of the coating liquid at the primary bar and a deposit amount of the coating liquid after the strip-shaped body passed through the secondary bar is unsuitable, a problem that a liquid reservoir uniform along the width direction of the support web can not be formed in the between-bars liquid reservoir can

also arise. In addition, when the coating amount is too excessive relative to the deposit amount, the liquid reservoir may fluctuate in the width direction of the support web to produce a streak defect, etc.

[0012]

The invention is achieved in order to solve the above described problems, and an object thereof is to provide a coating apparatus and a coating method capable of performing coating stably in a broad range of coating conditions and inhibiting the occurrence of the product failures.

[0013]

[Means for Addressing the Subjects]

The invention recited in Claim1 is a coating apparatus for coating with coating liquid a surface of a strip-shaped body carried in a fixed direction, the apparatus including: a primary bar extending along a width direction of a carrying plane, which is a carrying path of the strip-shaped body; a secondary bar extending in parallel with the primary bar on the downstream side of the primary bar; and a between-bars liquid reservoir disposed between the primary bar and the secondary bar for storing the coating liquid therein at the time of coating of the coating liquid, wherein coating conditions at the primary bar and the secondary bar are set so that the relationship $W_2 < W_1$ is formed, where a coating amount

of the coating liquid at the primary bar is W_1 and a coating amount of the coating liquid after the strip-shaped body has passed through the secondary bar is W_2.

[0014]

In the coating apparatus, the coating liquid applied to the surface of the strip-shaped body with the coating amount W_1 at the primary bar is adjusted to the coating amount W_2 at the secondary bar so that the relationship $W_2 < W_1$ is formed. In other words, the coating liquid excessively applied at the primary bar is scraped off at the secondary bar to be adjusted to the predetermined coating amount W_2, and thereby, the uniformly coated surface can be obtained.

[0015]

Further, at the time of coating of the coating liquid, the coating liquid pools between the primary bar and the secondary bar to form the coating liquid reservoir. Accordingly, entrained air following the strip-shaped body and introduced from the upstream side of the coating apparatus is pushed back toward the upstream direction by the pressure of the coating liquid in the coating liquid reservoir, in other words, the entrained air is cut. Here, since the coating amount at the primary bar is larger than the deposit amount of the coating liquid after the strip-shaped body has passed through the secondary bar, the coating liquid is stably stored between the primary bar and the secondary bar to form the coating liquid reservoir uniform along the width direction of the strip-shaped

body. Therefore, even in the case where the carrying speed of the strip-shaped body is increased, a uniformly coated surface can be obtained without occurrence of the shortage of liquid due to the entrained air.

[0016]

The primary bar and the secondary bar may be smooth bars having smooth surfaces, grooved bars having circumferentially grooved surfaces, and wire bars formed by winding a metal wire having a diameter on the order of 0.05 to 1.5 mm on the surface with predetermined pitches or tightly.

[0017]

The primary bar and the secondary bar may be rotated in the same direction as the carrying direction of the strip-shaped body, or rotated in the opposite direction to the carrying direction. Further, in the case where the bars are rotated in the same direction as the carrying direction, they may be rotated at the same speed as the carrying speed of the strip-shaped body, or rotated at the different speed from the carrying speed.

[0018]

As the coating conditions that can be set at the primary bar, the number of rotations of the bar, the area and the form of the groove on the bar surface, the bar surface form defined by the thickness of the wire wounded on the bar surface and the winding

form defined by the thickness of the wire wounded on the bar surface and the winding pitch thereof, the viscosity of the coating liquid, the carrying speed of the strip-shaped body, and the like can be cited.

[0019]

In addition, as the coating conditions that can be set at the secondary bar, the bar surface form and the like can be cited.

[0020]

Examples of the strip-shaped body include a base material having flexibility in the form of continuous strip, and specifically, a base material used for a photosensitive material or a magnetic recording material other than the support web. Examples of the base material include the support web, a base material for photographic film, baryta-coated paper for photographic paper, a base material for audiotape, a base material for video tape, a base material for floppy (R) disc, etc. In addition to these, a metal thin plate used for painted metal plate such as a colored iron plate can be cited.

[0021]

Examples of the coating liquid include colloid liquid of a photosensitive agent used for forming a photosensitive layer for silver salt photography, magnetic layer forming liquid used for forming a magnetic layer in the magnetic recording material, various kinds

layer of the painted metal thin plate and the like, other than the plate-making layer forming liquid described in the section of "Prior Art".

[0022]

The invention recited in Claim2 is a coating apparatus, wherein the coating conditions of the coating liquid at the primary bar and the secondary bar are set so that the relationship $W_2 < W_1 < 1.3 \times W_2$ is formed.

[0023]

In the coating apparatus, since the W_1 is not far excessive relative to the W_2, the liquid reservoir hardly fluctuates in the width direction of the support web, and thereby, the occurrence of the streak defects can be effectively prevented.

[0024]

The invention recited in Claim3 is a coating apparatus, wherein the primary bar is a wire bar formed by winding a wire around a rod, and the coating amount of the coating liquid at the primary bar is set so that the following expression: $W_1 = 17.4365 \times r(2.167\eta + 0.289K)/L$ is met by W_1, a diameter r (mm) of the wire, the number of rotations K (rpm) of the primary bar, viscosity η (cps) of the coating liquid, and the carrying speed L (m/min).

[0025]

In the coating apparatus, since a wire bar is used as the primary bar, a large amount of coating liquid can be scraped up and a high coating amount W_1 can be obtained. Further, since the coating amount W_1 is defined by the relationship between the diameter r (mm) of the wire wounded on the primary bar, the number of rotations K (rpm) of the primary bar, the viscosity η (cps) of the coating liquid, and the carrying speed L (m/min), the coating amount of the coating liquid at the primary bar can be set so that the optimum coating amount W_1 can be obtained in the relationship between the wire diameter r and the number of rotations K of the primary bar and the coating liquid viscosity η.

[0026]

The invention recited in Claim4 is a coating apparatus including an air-liquid interface forming means for forming an air-liquid interface, which is an interface between the coating liquid and air in the between-bars liquid reservoir at the time of coating.

[0027]

In the coating apparatus, since a stable coating liquid bead is formed on the upstream side of the secondary bar by forming the air-liquid interface at the between-bars liquid reservoir, even in the case where the strip-shaped body is carried at high speed, or liquid with high viscosity is used as the coating liquid, coating of the coating liquid can be performed stably. Thereby, the occurrence of defects can be prevented further effectively compared to the coating apparatus recited in Claim1 of the invention, and examples of the

defects include the ripple streaks as a wavelike non-uniform portion that appears in the width direction of the strip-shaped body, and streak form defects that similarly appears in the width direction of the strip-shaped body such as white dropout streaks that occur because the coating liquid is not deposited sufficiently, equal pitch streaks that occur on the front surface of the strip-shaped body thinly with equal pitches, and black unevenness produced because the coating liquid is excessively deposited by the rising of the coating liquid level between the primary bar and the secondary bar.

[0028]

As the air-liquid interface forming means, for example, a coating liquid sucking out means, which will be described later, etc. can be cited.

[0029]

The invention recited in Claim5 is a coating apparatus, wherein the air-liquid interface forming portion includes a coating liquid sucking out part for sucking out the coating liquid stored in the between-bars liquid reservoir.

[0030]

In the coating apparatus, by sucking out the coating liquid stored in the between-bars liquid reservoir with the coating liquid sucking out means, the liquid level of

the coating liquid in the between-bars liquid reservoir is lowered to form the air-liquid interface.

[0031]

The invention recited in Claim6 is a coating apparatus, wherein a primary coating liquid supply flow path for supplying the coating liquid is formed on the upstream side of the primary bar, and the coating liquid sucking out means is a communicating flow path for allowing communication between the between-bars liquid reservoir and the primary coating liquid supply flow path.

[0032]

The coating apparatus is an example in which the coating liquid sucking out means is provided as the air-liquid interface forming means.

[0033]

In the coating apparatus, since the sucking out effect caused by the flow of the coating liquid within the primary coating liquid supply flow path is utilized for forming the air-liquid interface within the coating liquid reservoir, the construction is simple, and the operation is assured.

[0034]

The invention recited in Claim7 is a coating apparatus, wherein the strip-shaped body is a support web for forming a base material of a planographic printing plate precursor, and the coating liquid is plate-making layer forming liquid for forming a plate-making layer of the planographic printing plate precursor.

[0035]

The coating apparatus is an example in which the coating apparatus of the invention is applied to the manufacture of the planographic printing plate precursor.

[0036]

According to the coating apparatus, since the grained surface of the support web can be coated uniformly with the plate-making layer forming liquid even in the case where the carrying speed is high, a planographic printing plate precursor having a plate-making layer with high uniformity can be manufactured with high productivity.

[0037]

The invention recited in Claim8 is a coating method for coating with coating liquid a surface of a strip-shaped body carried in a fixed direction, the method using a coating apparatus including: a primary bar extending along a width direction of a carrying plane, which is a carrying path of the strip-shaped body; a secondary bar extending in parallel with the primary bar on the downstream side of the primary bar; and a

between-bars liquid reservoir disposed between the primary bar and the secondary bar for storing the coating liquid therein at the time of coating of the coating liquid, coating with the coating liquid at the primary bar and regulating a coating amount of the coating liquid at the secondary bar so that the relationship $W_2 < W_1$ is formed, where a coating amount of the coating liquid at the primary bar is W_1 and a coating amount of the coating liquid after the strip-shaped body has passed through the secondary bar is W_2.

[0038]

For the same reason as that recited in Claim 1, according to the coating method, even in the case where the carrying speed of the strip-shaped body is increased, a uniformly coated surface can be obtained without occurrence of the shortage of liquid due to the entrained air.

[0039]

[Embodiments]

Embodiment 1

[0040]

Hereinafter, a bar coater as an example of a coating apparatus of the present invention will be described.

A bar coater 100 according to Embodiment 1 is a coating apparatus for coating, with plate-making layer forming liquid, a roughened surface of a support web W carried along a direction shown by an arrow a as an example of a strip-shaped body in the invention, as shown in Fig. 1.

[0041]

The bar coater has a primary bar 2 extending along a direction orthogonal to the carrying direction t of the support web W on the carrying plane, which is a carrying path of the strip-shaped body, a secondary bar 4 provided on the downstream side of the primary bar 2 in parallel with and at the same height as the primary bar 2, and a between-bars liquid reservoir 6 located between the primary bar 2 and the secondary bar 4.

[0042]

Both the primary bar 2 and the secondary bar 4 rotate in the same direction as the carrying direction t seen from the carrying plane T as the carrying path of the support web W.

[0043]

The primary bar 2 and the secondary bar 4 may be smooth bars, however, wire bars formed by tightly winging a wire 2A (4A) on a surface of a smooth bar 2B (4B) as shown in Figs. 2 to 5 are preferably used. The diameter of the wire 2A (4A) can be

suitably determined depending on the coating conditions, the composition and the viscosity of the coating liquid, etc., and preferably within a range of 0.05 to 1.5 mm.

[0044]

A distance between the center lines of the primary bar 2 and secondary bar 4 can be suitably determined according to the composition and the viscosity of the plate-making layer forming liquid, however, normally, the distance is determined such that the time between the support web W passing through the primary bar 2 and passing through the secondary bar 4 can be equal to or less than 0.02 seconds.

[0045]

The primary bar 2 and the secondary bar 4 are supported from below by a backup member 8. The between-bars liquid reservoir 6 is formed on the upper side of the backup member 8.

[0046]

On the upstream side of the backup member 8, a primary weir member (sheathing board) 10 as an example of a weir member in the invention is vertically provided, and, on the downstream side of the backup member 8, a secondary weir member (sheathing board) 12 is vertically provided. Both the primary weir member 10 and the secondary weir member 12 are provided vertically in parallel with the backup member 8.

[0047]

A primary supply flow path 14 is formed between the primary weir member 10 and the backup member 8, and a secondary supply flow path 16 is formed between the secondary weir member 12 and the backup member 8. The plate-making layer forming liquid is supplied from below toward the primary bar 2 in the primary supply flow path 14, and supplied from below toward the secondary bar 4 in the secondary supply flow path 16. Note that the plate-making layer forming liquid is independently supplied to the primary supply flow path 14 and the secondary supply flow path 16, respectively.

[0048]

When the plate-making layer forming liquid deposited on the tip ends of the primary weir member 10 and the secondary weir member 12 is dried, foreign matter like slag is produced, and when the foreign matter adheres to the coated surface of the support web W, surface defects such as a streak defect occur. If the tip ends of the primary weir member 10 and the secondary weir member 12 are constantly kept in a covered state by the plate-making layer forming liquid, the above described drying and following production of foreign matter can be prevented, however, for this purpose, it is necessary to allow the plate-making layer forming liquid to flow downward uniformly across the overall width of the primary weir member 10 and the secondary weir member 12. By setting the straightness of height distribution along the width direction of the primary weir member 10

and the secondary weir member 12 to equal to or less than 0.5 mm per meter, and setting the flow rate of the plate-making layer forming liquid in the primary supply flow path 14 and the secondary supply flow path 16 such that the top portions of the primary weir member 10 and the secondary weir member 12 may be constantly covered by the plate-making layer forming liquid, the plate-making layer forming liquid can be allowed to flow downward uniformly.

[0049]

In the backup member 8, a communicating flow path 18 for allowing communication between the between-bars liquid reservoir 6 and the primary supply flow path 14 is provided.

[0050]

As shown in Fig. 3, the communicating flow path 18 includes a vertical flow path 18A as a flow path that is open in the between-bars liquid reservoir 6 in the form of a continuous slit along a direction substantially orthogonal to the carrying direction t and extends downwardly along the vertical direction from the between-bars liquid reservoir 6, and a horizontal flow path 18B provided in a horizontal direction from the lower end of the vertical flow path 18A to the primary supply flow path 14. The horizontal flow path 18B may be formed in the form of a divided slit that is divided into two or more along the width

direction, or may be a flow path constituted by a number of small holes in parallel with each other.

[0051]

By the way, the vertical flow path 18A may be open in the form of a divided slit in the between-bars liquid reservoir 6 as shown in Fig. 4, or may have openings in the form of small holes arranged in a row or plural rows as shown in Fig. 5.

[0052]

The primary weir member 10 is formed so that the top portion thereof is lower than the carrying plane T.

[0053]

In the bar coater 100, the plate-making layer forming liquid supplied from the primary supply flow path 14 is scraped upwardly by the primary bar 2 and deposited on the roughened surface of the support web W.

[0054]

A part of the plate-making layer forming liquid is fed toward the downstream side by the primary bar 2 and stored in the between-bars liquid reservoir 6.

[0055]

The support web W having passed through the primary bar 2 passes through the between-bars liquid reservoir 6.

[0056]

The support web W having passed through the between-bars liquid reservoir 6 then passes through the secondary bar 4. At the secondary bar 4, the plate-making layer forming liquid applied to the support web W is adjusted to the predetermined coating amount.

[0057]

To the secondary bar 4, the plate-making layer forming liquid is supplied from the secondary supply flow path 16, and, to the secondary supply flow path 16, the plate-making layer forming liquid is supplied via a flow path independent from that for the primary supply flow path 14.

[0058]

Here, assuming that the diameter of the wire 2A of the primary bar 2 is r (mm), the number of rotations of the primary bar 2 is K (rpm), the viscosity of the plate-making layer forming liquid is η (cps), and the carrying speed of the support web W is L (m/min), the number of rotations K of the primary bar 2, the viscosity η of the plate-making layer

forming liquid, and the carrying speed L of the support web W are set so that the following expressions are held between the coating amount W_1 of the plate-making layer forming liquid at the primary bar 2 and the coating amount W_2 after the web has passed through the secondary bar 4.

$$W_1 = 17.4365 \times r(2.167\eta + 0.289K)/L$$

$$W_2 < W_1 < 1.3\ W_2$$

Note that the coating amount W_2 is a desired coating amount determined by the surface form of the secondary bar 4.

[0059]

Therefore, in the between-bars liquid reservoir 6, since the plate-making layer forming liquid is stably stored, the coating liquid reservoir is stably formed. Thus, an especially stable bead is formed on the periphery of the secondary bar 4, and thereby, defects caused by the instability of the bead can be effectively prevented.

[0060]

When the support web W passes through the between-bars liquid reservoir 6, since the entrained air on the surface of the support web W is cut by the coating liquid stored in the between-bars liquid reservoir 6, the defects such as shortage of liquid hardly occur in the coating film.

[0061]

In the primary supply flow path 14, since the plate-making layer forming liquid circulates upwardly, pressure is reduced at the opening portion of the horizontal flow path 18B on the side of the primary supply flow path 14. Since the horizontal flow path 18B communicates with the between-bars liquid reservoir 6 via the vertical flow path 18A, the plate-making layer forming liquid within the between-bars liquid reservoir 6 flows into the vertical flow path 18A, passes through the horizontal flow path 18B, and flows out into the primary supply flow path 14. Therefore, as shown in Fig. 1 by an arrow b, the flow from the between-bars liquid reservoir 6 through the communicating flow path 18 to the primary supply flow path 14 is produced.

[0062]

Here, since the height of the primary supply flow path 14 is equal to the height of the primary weir member 10, and the height of the primary weir member 10 is lower than the height of the carrying plane T, i.e., the height of the top portion of the primary bar 2, the liquid level of the between-bars liquid reservoir 6 is lowered to the height of the primary weir member 10, and a space is formed between the liquid level and the support web W. Thereby, an air-liquid interface is formed at the between-bars liquid reservoir 6.

[0063]

Since the air-liquid interface is formed at the between-bars liquid reservoir 6 as described above, the stable bead of the plate-making layer forming liquid is formed on the upstream side of the secondary bar 4. Accordingly, even in the case where the support web W is carried at high speed, and the plate-making layer forming liquid with high viscosity is supplied from the primary supply flow path 14, a stably coated surface can be obtained without streak defects such as ripple streaks, white dropout streaks, equal pitch streaks, black unevenness.

[0064]

2. Embodiment 2

Another example of the coating apparatus according to the invention is shown in Fig. 6. In Fig. 6, the reference numbers and symbols, which are the same as those in Figs. 1 to 5 indicate the same elements as those in Figs. 1 to 5.

[0065]

A bar coater 102 according to Embodiment 2 has a similar construction to the coating apparatus according to Embodiment 1 except that no communicating flow path 18 is provided in the backup member 8, as shown in Fig. 5.

[0066]

The number of rotations K of the primary bar 2, the viscosity η of the plate-making layer forming liquid, and the carrying speed L of the support web W are set so that the following expressions are held between the diameter r (mm) of the wire 2A, the number of rotations K (rpm) of the primary bar 2, the viscosity η (cps) of the plate-making layer forming liquid, the carrying speed L (m/min) of the support web W, the coating amount W_1 of the plate-making layer forming liquid at the primary bar 2, and the coating amount W_2 after the web has passed through the secondary bar 4:

$$W_1 = 17.4365 \times r(2.167\eta + 0.289K)/L,$$

$$W_2 < W_1 < 1.3\ W_2.$$

[0067]

In the bar coater 102, the plate-making layer forming liquid supplied from the primary supply flow path 14 is also scraped upwardly by the primary bar 2 and deposited on the roughened surface of the support web W.

[0068]

The support web W having passed through the primary bar 2 passes through the between-bars liquid reservoir 6.

[0069]

The support web W having passed through the between-bars liquid reservoir 6 then passes through the secondary bar 4. At the secondary bar 4, the plate-making layer forming liquid applied to the support web W is adjusted to the predetermined coating amount.

[0070]

When the support web W passes through the between-bars liquid reservoir 6, since the entrained air on the surface of the support web W is cut by the coating liquid stored in the between-bars liquid reservoir 6, the defects such as shortage of liquid hardly occur in the coating film.

[0071]

Further, since the communicating flow path is unnecessary to be provided in the backup member 8, the construction can be simplified.

[0072]

[Examples]

(Examples 1 to 4, Comparative Example 1)

By using the bar coater shown in Fig. 1, the grained surface of the support web is coated with photosensitive layer forming liquid. The coating conditions are as follows.

[0073]

Viscosity of photosensitive layer forming liquid	8 cp
Carrying speed	120 m/min
Support web thickness	0.3 mm
Support web width	1000 mm
Bar coater width	1600 mm

The coating of the photosensitive layer forming liquid is performed by setting the flow rate in the primary supply flow path 14 and the secondary supply flow path 16 so that the coating amount W_1 at the primary bar 2 and the deposit amount W_2 on the downstream side of the secondary bar can be the values shown in Table 1. Then, by visually observing the surface of the obtained planographic printing plate precursor, the number of produced streak defects per 1000 m is counted. The result is shown in Table 1.

[0074]

[Table 1]

	W_2 (g/m^2)	W_1 (g/m^2)	Number of defects (number of streaks/1000m)
Comparative Example 1	1.5	1.4	Occur on the entire surface
Example 1	1.5	1.6	2
Example 2	1.5	1.8	5
Example 3	1.5	1.9	20
Example 4	1.5	2.0	251

As shown in Table 1, in Comparative Example 1 where the coating amount W_1 is smaller than the deposit amount W_2, the streak defects occur on the entire surface of the planographic printing plate precursor, and the number of the produced streak defects per 1000 m can not be counted.

[0075]

On the other hand, in Examples 1 to 4 where the coating amount W_1 is larger than the deposit amount W_2, the number of the produced streak defects per 1000 m on the planographic printing plate precursor is 2 to 251, which is smaller than that in Comparative Example 1. Particularly, in Examples 1 to 3 where the coating amount W_1 and the deposit amount W_2 are in the relationship of $W_2 < W_1 < 1.3 \times W_2$, the number of the produced streak defects per 1000 m on the planographic printing plate precursor is especially smaller as 2 to 20.

[0076]

[Effect of the Invention]

As described above, the present invention can provide a coating apparatus and a coating method capable of performing coating stably in a broad range of coating conditions and inhibiting the occurrence of the product failures.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[Fig. 1] Fig. 1 is a sectional view showing a construction of a bar coater according to a first embodiment of the present invention.

[Fig. 2] Fig. 2 is an enlarged view showing a construction of a primary bar and a secondary bar included in the bar coater shown in Fig. 1.

[Fig. 3] Fig. 3 is a perspective view of the bar coater shown in Fig. 1 seen from an upper oblique direction.

[Fig. 4] Fig. 4 is a perspective view showing an example in which the bar coater shown in Fig. 1 has a communicating flow path having a different form from that shown in Fig. 1.

[Fig. 5] Fig.5 is a perspective view showing an example in which the bar coater shown in Fig. 1 has a communicating flow path having a different form from those shown in Figs. 1 and 3.

[Fig. 6] Fig. 6 is a sectional view showing a construction of a bar coater according to a second embodiment of the present invention.

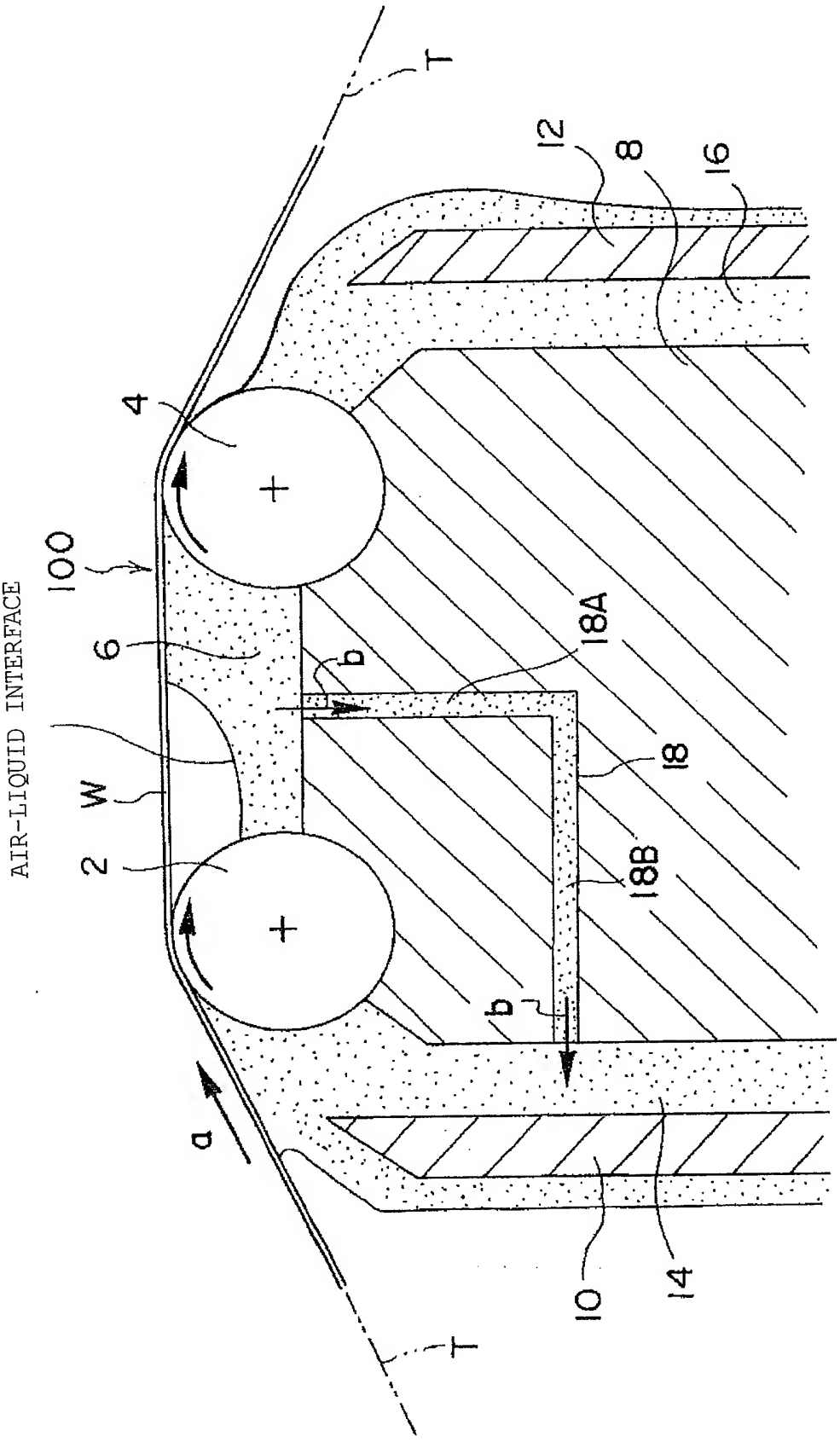
[Description of the Reference Numerals]

2: PRIMARY BAR
4: SECONDARY BAR
6: BETWEEN-BARS LIQUID RESERVOIR
8: BACKUP MEMBER
10: PRIMARY WEIR MEMBER
12: SECONDARY WEIR MEMBER
14: PRIMARY SUPPLY FLOW PATH
16: SECONDARY SUPPLY FLOW PATH
18: COMMUNICATING FLOW PATH
100: BAR COATER

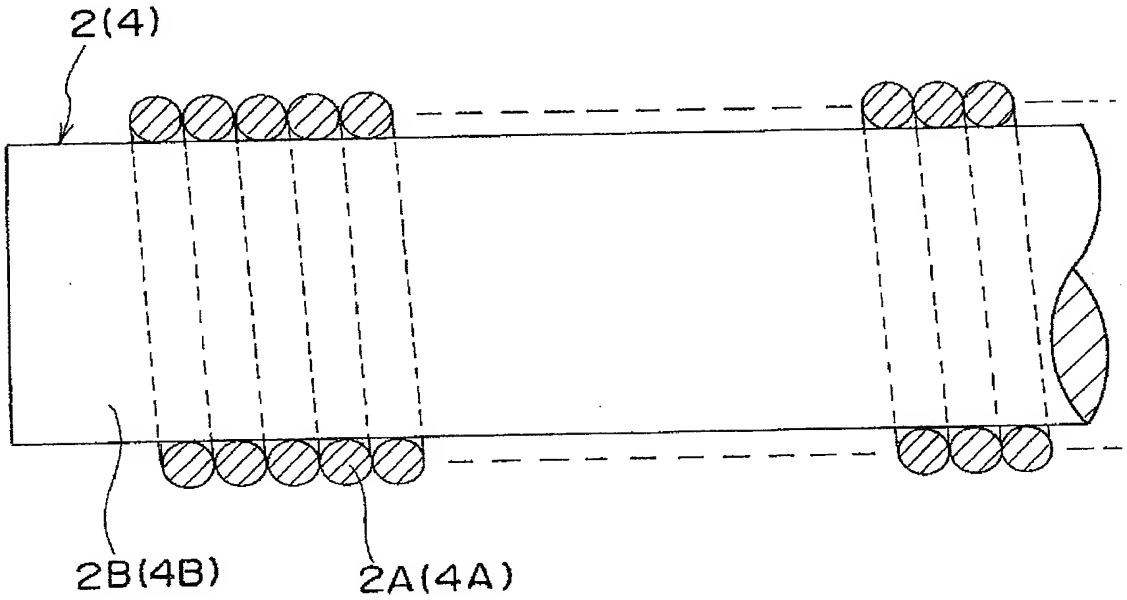
102: BAR COATER

[DOCUMENT NAME] DRAWINGS

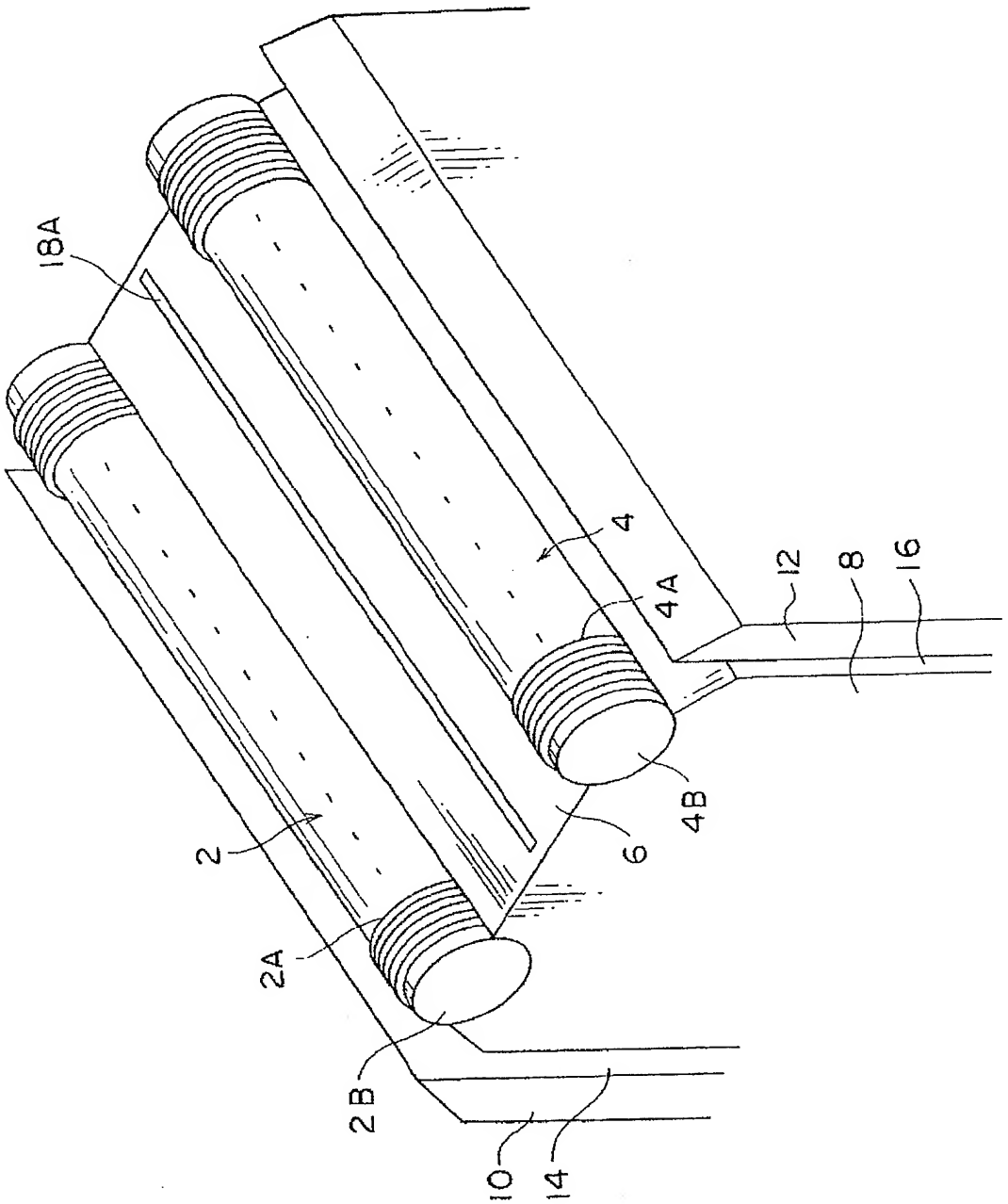
[Fig. 1]



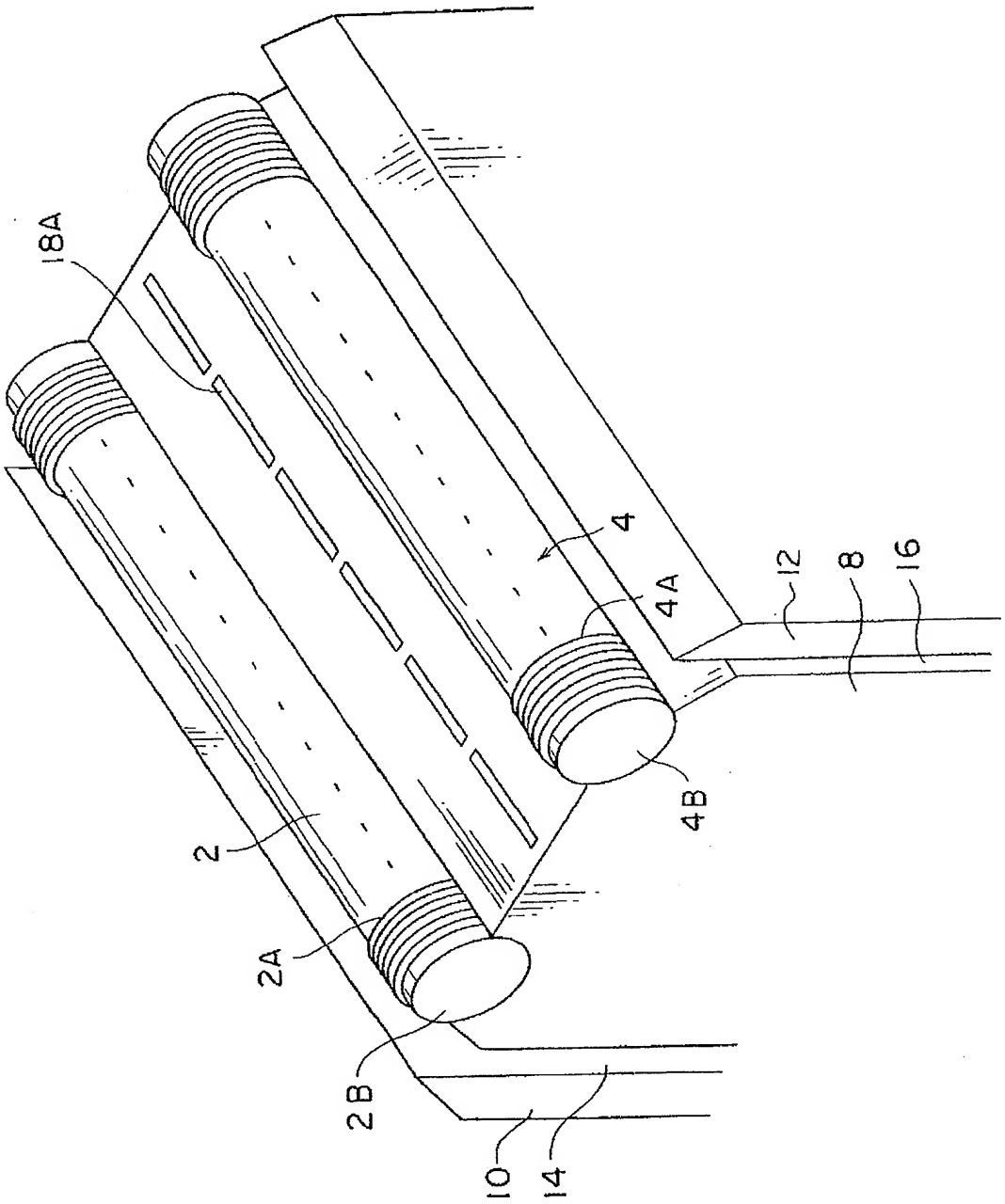
[Fig. 2]



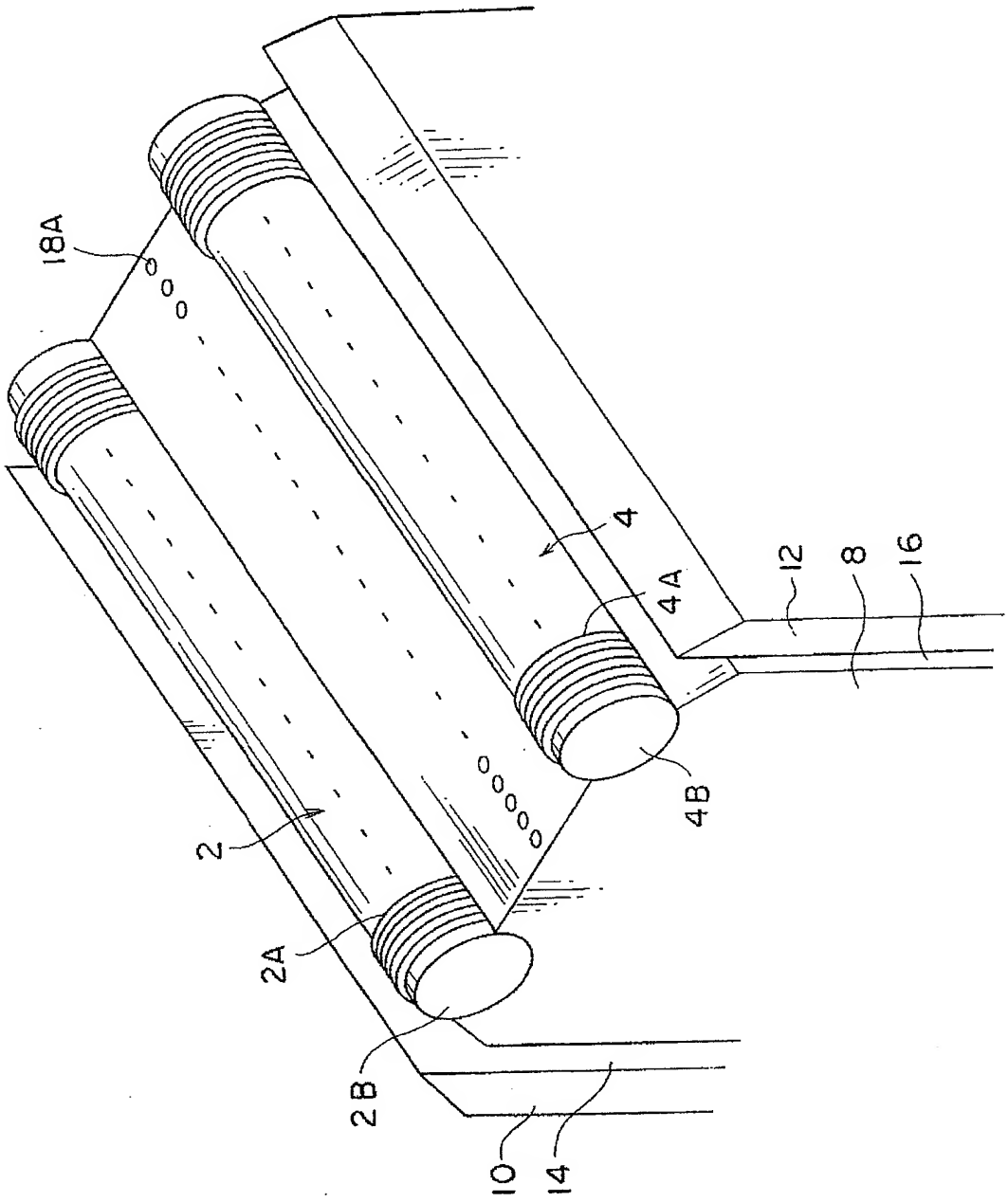
[Fig. 3]



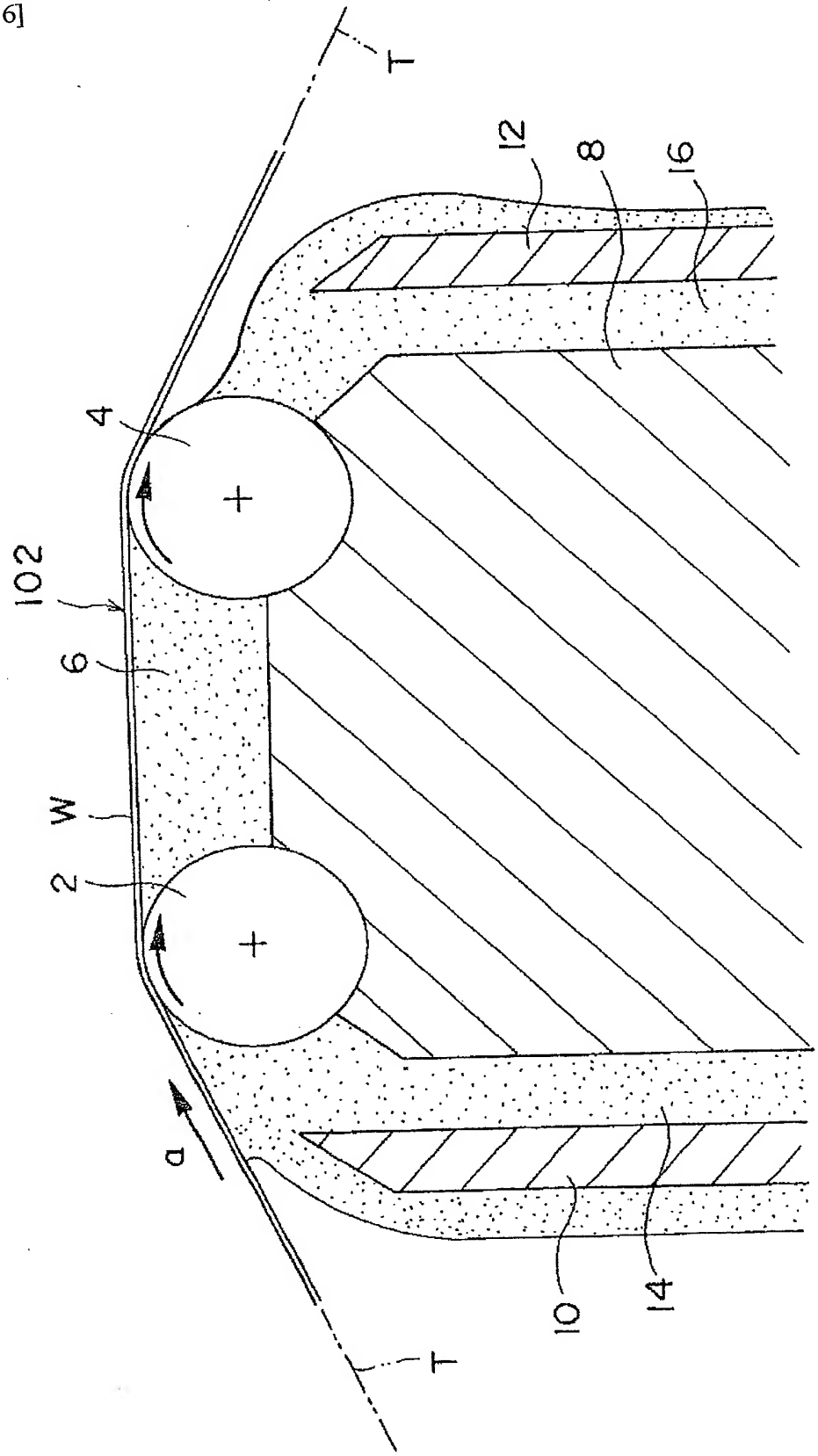
[Fig. 4]



[Fig. 5]



[Fig. 6]



[DOCUMENT NAME] ABSTRACT OF DISCLOSURE

[SUMMARY]

[OBJECT]

To provide a coating apparatus and a coating method capable of performing coating stably in a broad range of coating conditions and inhibiting the occurrence of the product failures.

[MEANS FOR SOLUTION]

A coating apparatus for coating with coating liquid a surface of a strip-shaped body carried in a fixed direction, the apparatus comprising a primary bar extending along a width direction of a carrying plane, which is a carrying path of the strip-shaped body, a secondary bar extending in parallel with the primary bar and disposed at a downstream side of the primary bar, and a between-bars liquid reservoir disposed between the primary bar and the secondary bar for storing the coating liquid at a time of coating of the coating liquid, wherein coating conditions at the primary bar and the secondary bar are set so that the following condition is met,

$$W_2 < W_1$$

where W_1 is a coating amount of the coating liquid at the primary bar and W_2 is a coating amount of the coating liquid after the strip-shaped body has passed the secondary bar, and a coating method.

[SELECTED FIGURE] Fig. 1